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THE WALKER PAPERS

RECAPITALIZING NUCLEAR WEAPONS

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8

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Brig Gen Kenneth Newton Walker

Kenneth Walker enlisted at Denver, Colorado, on 15 December 1917. He took flying training at Mather Field, California, getting his commission and wings in November 1918.

After a tour in the Philippines, he returned to Langley Field, Virginia, in February 1925 with a subsequent assignment in December 1928 to attend the Air Corps Tactical School. Retained on the faculty as a bombardment instructor, Walker became the epitome of the strategic thinkers at the school and coined the revolutionary airpower "creed of the bomber": "A well-planned, well-organized and well-flown air force attack will constitute an offensive that cannot be stopped."

Following attendance at the Command and General Staff School at Fort Leavenworth, Kansas, in 1933 and promotion to major, he served for three years at Hamilton Field, California, and another three years at Luke Field, Ford Island, and Wheeler Field, Hawaii. Walker returned to the United States in January 1941 as assistant chief of the Plans Division for the chief of the Air Corps in Washington, DC.

He was promoted to lieutenant colonel in July 1941 and colonel in March 1942. During this time, when he worked in the Operations Division of the War Department General Staff, he coauthored the air-campaign strategy known as Air War Plans Division—Plan 1, the plan for organizing, equipping, deploying, and employing the Army Air Forces to defeat Germany and Japan should the United States become embroiled in war. The authors completed this monumental undertaking in less than one month, just before Japan attacked Pearl Harbor—and the United States was, in fact, at war.

In June 1942, he was promoted to brigadier general and assigned by Gen George Kenney as commander of Fifth Air Force's Bomber Command. In this capacity, he repeatedly accompanied his B-24 and B-17 units on bombing missions deep into enemy-held territory. Learning firsthand about combat conditions, he developed a highly efficient technique for bombing when aircraft faced opposition by enemy fighter planes and antiaircraft fire.

General Walker was killed in action on 5 January 1943 while leading a bombing mission over Rabaul, New Britain—the hottest target in the theater. He was awarded the Medal of Honor. Its citation, in part, reads, "In the face of extremely heavy anti aircraft fire and determined opposition by enemy fighters, General Walker led an effective daylight bombing attack against shipping in the harbor at Rabaul, which resulted in direct hits on nine enemy vessels. During this action, his airplane was disabled and forced down by the attack of an overwhelming number of enemy fighters. He displayed conspicuous leadership above and beyond the call of duty involving personal valor and intrepidity at an extreme hazard to life." Walker is credited with being one of the men who built an organization that became the US Air Force.

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Recapitalizing Nuclear Weapons **Vaughan**

Thank you for your assistance.

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COLLEGE OF AEROSPACE DOCTRINE, RESEARCH AND EDUCATION

AIR UNIVERSITY

Recapitalizing Nuclear Weapons

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Air Force Fellows

Since 1958 the Air Force has assigned a small number of carefully chosen, experienced officers to serve one-year tours at distinguished civilian institutions studying national security policy and strategy. Beginning with the 1994 academic year, these programs were accorded in-residence credit as part of professional military education at senior service schools. In 2003 these fellowships assumed senior developmental education (SDE) force-development credit for eligible officers.

The SDE-level Air Force Fellows serve as visiting military ambassadors to their centers, devoting effort to expanding their colleagues' understanding of defense matters. As such, candidates for SDE-level fellowships have a broad knowledge of key Department of Defense (DOD) and Air Force issues. SDE-level fellows perform outreach by their presence and voice in sponsoring institutions. They are expected to provide advice as well as promote and explain Air Force and DOD policies, programs, and military-doctrine strategy to nationally recognized scholars, foreign dignitaries, and leading policy analysts. The Air Force Fellows also gain valuable perspectives from the exchange of ideas with these civilian leaders. SDE-level fellows are expected to apprise appropriate Air Force agencies of significant developments and emerging views on defense as well as economic and foreign policy issues within their centers. Each fellow is expected to use the unique access she or he has as grounds for research and writing on important national security issues. The SDE Air Force Fellows include the National Defense Fellows, the RAND Fellows, the National Security Fellows, and the Secretary of Defense Corporate Fellows. In addition, the Air Force Fellows program supports a post-SDE military fellow at the Council on Foreign Relations.

On the level of intermediate developmental education, the chief of staff approved several Air Force Fellowships focused on career broadening for Air Force majors. The Air Force Legisla-

tive Fellows program was established in April 1995, with the Foreign Policy Fellowship and Defense Advanced Research Projects Agency Fellowship coming under the Air Force Fellows program in 2003. In 2004 the Air Force Fellows also assumed responsibility for the National Laboratories Technologies Fellows.

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Foreword

Over its 60-year history, the United States Air Force has developed and maintained two of the three legs of the nuclear triad. Throughout the Cold War, America was confident that if any country were foolish enough to attack us, the nuclear stockpile could be unleashed to rain catastrophic destruction on our attackers making foreign aggression on American soil unacceptable. At the same time, America was assured that the most destructive weapons ever made were safe and secure.

While the future is uncertain, the number of nuclear-armed states continues to grow. Nuclear weapons have been and remain a key component of our defensive posture, and we cannot yet envision a time when our nation's defense will not include them. The nuclear weapons deployed today were designed during the Cold War and are not optimized for the security environment we have and envision for the future. Additionally, these nuclear weapons are aging, and as they age, the United States must invest in expensive life-extension programs to ensure their safety and reliability. It is critical that the United States act now to put in place a program to produce a reliable replacement warhead. Colonel Vaughan addresses some critical points in the attached thesis on the Reliable Replacement Warhead and the recapitalization of the nuclear weapons complex.

Producing a replacement warhead will exercise the nuclear weapons infrastructure and drive modernization in the nuclear weapons manufacturing and production facilities. This modernization must occur if the United States is to retain a viable nuclear weapons production capability well into the future.

Additionally, we need to capitalize on the experience of a generation of nuclear weapons designers who are nearing retirement age. With the 1992 halt of full-yield nuclear testing, it is even more critical for the next generation of design physicists and engineers to have the experience from those responsible for the systems now deployed. We cannot afford to lose the experience held by the current generation of nuclear weapon designers.

The Air Force is in partnership with the Department of Energy to develop and produce a replacement warhead. This effort must continue to fruition, and we must produce these

weapons to fully exercise and modernize the nuclear weapons infrastructure. Since the end of the Cold War every aspect of the United States' national policy, and the instruments of that policy, have continued to evolve, except the nuclear stockpile. We cannot afford to let our nuclear weapons and the necessary production capabilities atrophy. It is critical that we continue to have the ultimate confidence that the United States' nuclear weapons will remain safe and secure while still being able to work as required should the fateful decision to use them ever have to be made again. I encourage the reader to give thoughtful consideration to the points made in this paper.

BILLY W. MULLINS, SES, USAF
Associate Director of Strategic Security
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Operations, Plans and Requirements

About the Author

Lt Col Edgar M. Vaughan

Lt Col Edgar M. Vaughan received his commission in 1985 from the University of Wyoming Air Force Reserve Officer Training Corps (Distinguished Graduate) and was assigned to Kirtland AFB, New Mexico, as an electrical engineer. He was then selected to attend Northeastern University in Boston, Massachusetts, as a Draper Laboratory Fellow where he attained a master of science degree in electrical engineering.

Following an assignment to Hanscom AFB, Massachusetts, as the Joint Surveillance Target Attack Radar System (JSTARS) mission crew training system program manager, Colonel Vaughan reported to Kelly AFB, Texas, where he directed the joint electronic warfare reprogramming exercises for the combatant commanders and services. He was then assigned as chief of Information Warfare and later executive officer for the Director of Operations at Headquarters Air Mobility Command (AMC), Scott AFB, Illinois.

After his tour at AMC, he was assigned to the Pentagon as chief, Special Missions Branch, Assistant Secretary of the Air Force (Acquisition), where he served as the acquisition focal point for airlift programs supporting the president, vice president, Congress, and DOD leaders and then as executive officer, Global Reach programs. Colonel Vaughan was then selected to be the Chief, Executive Action Group for Assistant Secretary of the Air Force (Acquisition) (SAF/AQ), where he was a member of his personal staff.

Colonel Vaughan is a graduate of Squadron Officer School, Maxwell AFB, Alabama, and completed seminar programs for Air Command and Staff College and Air War College. He received his senior developmental education as a National Laboratory Technical Fellow at the Los Alamos National Laboratory, New Mexico. His awards include the Defense Meritorious Service Medal with one oak leaf cluster, Meritorious Service Medal with one oak leaf cluster, Air Force Commendation Medal, and Air Force Achievement Medal.

Currently, Colonel Vaughan is commander of the 560th Aircraft Sustainment Support Squadron, Robins AFB, Georgia, where he is responsible for modification and depot maintenance activities on the C-130 aircraft.

Abstract

The US nuclear weapons stockpile is aging and undergoing an extensive and expensive life-extension program to ensure the continuing safety, security, and reliability of the legacy weapons well into the future. The current stockpile, designed to meet the security challenges of the Cold War (highly optimized systems that employ exotic materials with high yields), is not optimized to meet post–Cold War national security challenges. Today's challenge is to sustain and modernize the United States nuclear weapons infrastructure with minimal risk and cost. The following factors must be considered:

1. Technological advances brought about by the Stockpile Stewardship Program make it possible to design weapons that will be less expensive to build, can be certified without full-yield nuclear testing, employ modern surety technologies, and will be less costly to maintain over the long term.

2. Building replacement/new weapons will exercise and force the nuclear weapons production infrastructure to modernize to an extent not possible with the current life-extension program approach.

3. Scientists and engineers with experience in designing and building nuclear weapons are nearing retirement, and it is critical that the United States capture their experience and pass it to the next generation of weapons designers.

4. The "need" for nuclear weapons will increasingly be challenged and debated by the public and the Congress. With the Cold War over and questions arising regarding the utility of nuclear weapons to deter rogue states and non-state actors, a clear vision on the need for nuclear weapons is required.

5. The federal budget is highly constrained for the foreseeable future and will likely result in flat (inflation-only increases) or decreases to the nuclear budget.

6. The 2001 Nuclear Posture Review includes a revision to the triad that must be considered in terms of overall nuclear force structure requirements.

To mitigate the risks and address the highly uncertain future security environment, the recapitalization effort of US nuclear weapons should begin immediately.

Acknowledgements

The Air Force established the National Laboratory Technical Fellowship program to familiarize a core of officers within the area of nuclear weapons. I am grateful for the opportunity to live and work at the birthplace of nuclear weapons. The United States owes a debt of gratitude to the professionals at Los Alamos who spend their lives ensuring we have a safe and reliable nuclear capability—thank you for your service.

I could not have completed this paper without the support and guidance of many individuals. I appreciate the sound counsel and enthusiastic support from Col Steve Suddarth, who challenged me to create a meaningful paper to help advance the arguments about if/when we should begin recapitalizing our nuclear weapons. Mr. Jonathan Ventura served as my Los Alamos National Laboratory (LANL) host and provided excellent advice both on my paper and during my year at LANL. I am in awe of the LANL Reliable Replacement Warhead project team for their dedication, professionalism, and expertise in designing a unique, safe, and reliable replacement alternative to the existing stockpile systems. Through these people, the spirit of the Manhattan Project lives on; their efforts have renewed my confidence that the nation's nuclear stockpile is in good hands. Finally, I would not have been able to focus on this study without the support of my family. My wife, Cee Ann, packed up the family for a one-year "remote" to the mesas of New Mexico and cheerfully supported my work. Finally, the conclusions in this paper were informed through previous efforts, but any errors are totally mine.

Edgar M. Vaughan

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Lieutenant Colonel, USAF

Chapter 1

Introduction

[T]he United States today is the only nuclear weapons state that cannot remanufacture replacements or produce new nuclear weapons.

—Douglas Feith
Undersecretary of Defense for Policy

The development of the first atomic bomb by the United States in 1945 was a defining moment in technological initiative and manufacturing expertise. After using an atomic bomb on Hiroshima on 6 August 1945, the United States assumed a worldwide leadership role in nuclear weapons design. Due to the end of the Cold War and subsequent halt in nuclear testing; improved relations with Russia; and the lack of design, development, and production of new weapons; the nuclear weapons complex created to sustain the warheads has not been sufficiently modernized and is at risk of not being able to support refurbishment or to correct future problems in a timely manner.[1] Douglas Feith, then undersecretary of Defense for Policy, highlighted the demise of this capability in testimony to the Senate Armed Services Committee on 14 February 2002.[2] It is imperative that the United States reverse this trend.

An Aging Stockpile

The US nuclear weapons stockpile includes systems designed more than 20 years ago when the threat of enemy attack included the Soviet Union. This stockpile was designed to provide an overwhelming destructive capability as a deterrent—even in the face of an all-out nuclear war launched against the United States—ensuring that a preemptive first strike would not achieve the goals of the attacking nation. To fit the delivery systems, the weapons were optimized for maximum destructive yield with minimum size and weight of the warhead. The imperative to maximize yield led to additional complexity and

the use of exotic materials, making it more difficult and costly to maintain the warheads and, when required, remanufacture parts. With improved relations with Russia following the Cold War, the "peace dividend" allowed placing legacy nuclear warheads into a mostly maintenance mode, ensuring their safety and reliability without developing new capabilities or modifying existing ones (except for the B61-11, which provided a modified capability for earth penetration in specific geologies). The infrastructure created to build and maintain nuclear weapons was allowed to atrophy, placing in jeopardy the nation's ability to quickly remanufacture replacements or produce new weapons should the military services require them and the administration and the Congress approve.

Another consideration is the moratorium on nuclear testing. The FY-93 Energy and Water Development Appropriations Act placed strict limits on the number and purpose of US nuclear tests and established an initial nine-month moratorium on nuclear testing, which has been maintained since that time.[3] The moratorium was initially established as a political decision to begin complying with the Comprehensive Test Ban Treaty without formally signing that agreement. Existing stockpiles that had been tested and certified as operational were placed in the Stockpile Stewardship Program (SSP), which was created to monitor the condition of the various warheads and address any issues with safety and reliability through small- to large-scale experiments, nonnuclear testing, analysis, and computer simulations.

Life extension programs (LEP) address concerns identified during the surveillance program with a timely rebuild or replacement of components to ensure the continued reliability of each warhead. However, each rebuild or replacement potentially introduces minor changes into the original tested system, and experience from the nuclear test program indicates that sometimes even what may appear to be minor changes may affect overall system performance. There are concerns that the incremental changes made to existing warheads will ultimately increase the uncertainty in their long-term certification. If the United States is required to reduce uncertainty in performance, a recommendation could be made to resume nuclear testing by either the design laboratories or US Strategic Command (STRATCOM). Any decision to resume testing

would require the approval of Congress. Military planners use the performance bounds of warhead types to make targeting decisions. As the error bounds increase, targeting assumptions must be modified or the weapon must be tested to reestablish error bounds.

A further concern is the growing realization that the current nuclear weapons stockpile may not be the right stockpile to address the national security requirements of the future. Amb. Linton Brooks, National Nuclear Security Administration director, stated in a congressional testimony, "Although nuclear weapons issues are usually contentious, I believe that most would agree that if we were starting to build the stockpile from scratch today we would take a much different approach than we took during the cold war."[4] The United States is at a critical decision point—either begin the effort to transform both the nuclear weapons infrastructure and the stockpile or continue along the current path, which includes maintaining existing weapons systems for the next 20 to 30 years and accepting the risk that the ability to quickly remanufacture and/or produce nuclear weapons will eventually be lost.

Points of View

Before addressing the issues stated above, it is instructive to categorize the points of view of various communities concerned about the future of nuclear weapons. The extreme views (unilaterally eliminate all nuclear weapons or significantly lower the threshold, making it easier to use nuclear weapons) are not addressed here because the probability of gaining a political consensus to implement either of these views is negligible. This paper will address three different views, which are postulated below.

Aggressors

The first point of view—labeled *Aggressors* for this paper—includes the imperative that nuclear weapons are absolutely critical to the security of the United States; therefore, it should be well prepared to use nuclear weapons in the future. While acknowledging numerous obstacles to using nuclear weapons, Aggressors believe the nation's use of nuclear weapons in future conflicts is

a significant possibility. Aggressors envision a war-fighting use of nuclear weapons in addition to their deterrent value. They advocate a resurgence of the overall nuclear infrastructure, development of new weapons to provide the president options to address future threat scenarios, and a continued reliance on the supremacy of nuclear deterrence. They are concerned that relations with Russia may worsen in the future, harkening back to a need for large stockpiles. They are concerned that China will be a true competitor with the United States—economically and militarily. They believe that the *right* nuclear weapons can deter some nonstate terrorist actors, and failing deterrence, could be a viable tool to preemptively destroy an adversary's weapon of mass destruction (WMD) production capability. Finally, Aggressors are concerned that the United States is approaching a critical point in maintaining the core personnel with experience in nuclear weapons design and engineering. In summary, Aggressors advocate modernizing the nuclear weapons infrastructure (to include increased funding); maintaining a sufficiently large, varied stockpile; and ensuring the United States maintains a sufficient core of experienced scientists and engineers.

Defenders

At the other end of the spectrum are the *Defenders*. They acknowledge the need for some level of nuclear deterrence but believe (hope) there will never be a time when the United States will use a nuclear weapon. They do not accept a "war-fighting" use of nuclear weapons. They advocate the smallest stockpile possible under the assumption that sufficient deterrence can be achieved with "some" operational nuclear warheads. The Defenders do not believe terrorists can be deterred with nuclear weapons. They are opposed to developing new warheads and advocate ensuring minimal subsets of the existing warheads that, sufficiently maintained, provide a credible deterrent. In this vein, Defenders are less concerned about achieving the designed yield of a specific weapon because a credible deterrent is achieved by having a high probability of some nuclear yield. Realizing that maintaining existing warheads incurs some cost, the Defenders might be persuaded to invest in infrastructure improvements *if* sufficient cost savings can be proved *and* a smaller stockpile

resulted. Defenders are not convinced the loss of experienced nuclear scientists and engineers is a crisis, and they are optimistic that sufficient talent can be maintained within the nuclear weapons complex as part of the day-to-day maintenance activities. Between these two views are the Gamblers.

Gamblers

The group called *Gamblers* recognizes that the United States has nuclear weapons and that those weapons are not going away in the near future. So what path can be taken to optimize the nuclear weapons stockpile while preparing for conventional war scenarios? Gamblers acknowledge military and political limitations on the United States' use of nuclear weapons, but they do not concede that nuclear weapons will never be used for war fighting. They advocate planning for situations in which the use of nuclear weapons could occur. Gamblers believe that the nuclear warheads need to be good enough and maintained in sufficient numbers to achieve national objectives, but they are willing to negotiate on the definitions of "good enough" or "sufficient" to gain another (conventional and/or nonkinetic) capability. They view nuclear weapons as one of many tools to achieve US national security requirements. They advocate a strong, responsive infrastructure and recognize the advantages of being able to quickly produce new capabilities in response to emerging threats. They prefer to minimize future risks through investments in modernizing the infrastructure and weigh the investment in nuclear weapons across the spectrum of military capabilities. Gamblers would consider reprioritization of funding to improve other (i.e., nonnuclear) tools, provided reasonable assurance that overall nuclear capability will not be significantly impacted. They share the concern about the loss of experienced nuclear scientists and engineers. Table 1 summarizes the points of view of all three groups. This paper advocates a Gamblers' point of view.

Alternatives

With this brief introduction of the problem and discussion on various points of view, the obvious question is: What should

Table 1. Points of view

Group	War-fighting Use	Responsive Infrastructure	Stockpile Size	Nuclear Trained Personnel	Respond to New Threats
Aggressors	Yes	Yes	Large	Crisis	Requires new weapons
Defenders	No	Maybe, if overall stockpile size is reduced	Small	Sufficient	No need for new weapons
Gamblers	Possibly	Yes	"Big enough"	Concern	Diversify responses

the United States do about it, if anything? This paper will address two alternatives: (1) maintain the status quo (or a smaller status quo) or (2) begin efforts to modernize the stockpile and transform the infrastructure.

Maintain Status Quo

Defenders make a strong case for maintaining the status quo. During the moratorium on underground testing, the Departments of Energy and Defense have assessed the nuclear weapons stockpile for nearly a decade. Using the SSP tools, they have determined the stockpile is safe, secure, and reliable without the need to resume testing. Defenders acknowledge concerns with stockpile aging but believe that existing processes and programs are sufficient—there is no "crisis" that requires a significant change in overall US policy. Development of "new" nuclear warheads to address the current threat environment is not warranted and could potentially start a new nuclear arms race, driving other countries to follow suit and leading to increased proliferation. Assuming future constrained budgets, investing in nuclear warheads is not a priority. Defenders argue that the system is not broken and further stockpile reductions, with current warheads, are sufficient to maintain the deterrent well into the future.

Gamblers acknowledge concerns with the current infrastructure versus potential future risks and believe the United

States needs to act now to address those risks. Gamblers' key concern is to ensure that the United States has a responsive infrastructure and the ability to address future threats. They also believe the costs associated with maintaining the existing stockpile cannot be sustained indefinitely.

Aggressors see a looming crisis and believe new warheads are required to counter known threats. They do not believe the status quo can be maintained indefinitely.

Recapitalize Nuclear Warheads and Modernize the Nuclear Weapons Infrastructure

This paper's hypothesis: If done correctly, recapitalization can appease the Defenders and result in a smaller, safer, cheaper, and more maintainable stockpile. Aggressors believe a combination of factors increases the imperative to begin the recapitalization of US warheads, even while acknowledging the sufficiency of the current stockpile. A phased approach must begin now to address their concerns while hedging the bet of the Gamblers.

First, as the existing stockpile is maintained with LEPs, the United States is incrementally moving away from "as-tested" nuclear systems. However, the "life-extended" warhead is slightly different from the stockpile-tested warhead. The United States should address the risk that, at some point in the future, a nuclear test may be required to recalibrate the warhead performance. It appears to be technically feasible that a replacement warhead can be produced and certified without nuclear testing at a lower risk than indefinitely maintaining the legacy systems. Two choices exist: (1) maintain the current warheads and face the increasing risk of future nuclear testing and cost risks associated with LEPs, or (2) design and produce replacement warheads with higher reliability margins that minimize the potential for future nuclear tests. To counter the argument that a replacement warhead cannot be produced and certified without nuclear testing, the former director of the Central Intelligence Agency, James Woolsey, said, "Keep in mind . . . we dropped the weapon on Hiroshima . . . without one ever having been detonated in the history of the world before. We were that confident 60 years ago in our ability to design and use that

weapon."[5] Producing a replacement warhead will require informed investments in the nuclear weapons infrastructure that will address both the Gamblers' and the Aggressors' concerns regarding a responsive infrastructure.

Producing a replacement warhead now would also provide a training opportunity for the next generation of nuclear weapons designers. Many personnel who designed, engineered, and produced the existing nuclear weapons stockpile are retired or nearing retirement. The certification of nuclear warheads requires balancing existing nuclear test data, analyzing warhead surveillance data, and utilizing the nuclear design/test experience of senior scientists and engineers. It is critical that the next generation of nuclear designers and engineers benefit from the previous generation's experience.

Finally, the threat environment has changed, and the existing stockpile was not designed for the current threat environment. Additional threat changes can be expected in the future, and the nuclear weapons complex must be modernized so it can quickly respond to those threats. This paper asserts that if no action is taken now, the United States could lose its future quick-response capability.

Preview of Remaining Chapters

Chapter 2 discusses the case for maintaining the status quo, primarily from the Defenders' point of view; that is, no significant changes are required. Chapter 3 addresses the risks of maintaining the status quo, intangible future threats, budget constraints, and concerns that the Nuclear Weapons Complex (NWC) can meet future requirements with the existing stockpile; it also makes a case for recapitalization. Chapter 4 discusses the elements of an effective future nuclear force structure, cites the need for a catalyst that will transform the NWC, and identifies the Reliable Replacement Warhead (RRW) program as the most suitable means to (1) demonstrate the ability to design and produce a warhead using stewardship tools and (2) identify needed infrastructure improvements. Chapter 4 also lists specific actions the Air Force can initiate to ensure that future recapitalization decisions address required military capabilities.

Notes

1. Harold M. Agnew et al, *FY 2000 Report to Congress of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile* (Washington, DC: Panel to Assess the Reliability, Safety, and Security of the US Nuclear Stockpile, 1 February 2001), ES-i, http://www.fas.org/nuke/control/ctbt/text/foster00.pdf.

2. Douglas J. Feith, statement before the Senate Armed Services Hearing on the Nuclear Posture Review, 14 February 2002, 9.

3. *Energy and Water Development Appropriations Act of 1993,* Public Law 377, 102nd Cong., 2nd sess. (2 October 1993), sec. 507.

4. Linton F. Brooks, statement before the Senate Armed Services Committee, Subcommittee on Strategic Forces, 4 April 2005, 2.

5. James R. Woolsey, "Session 2—The New Triad and its Assumptions: A Critique," *36th Annual IFPA-Fletcher Conference on National Security and Policy*, 14–15 December 2005, n.p., http://www.ifpafletcherconference.com/oldtranscripts/2005/woolsey.htm.

Chapter 2

The Case for Maintaining the Status Quo

> *However, there is no such thing as a "design life." The designers were not asked or permitted to design a nuclear weapon that would go bad after 20 years. They did their best on a combination of performance and endurance, and after experience with the weapon in storage there is certainly no reason to expect all of the nuclear weapons of a given type to become unusable after 20 or 25 years. In fact, one of the main goals of SBSS* [Science-Based Stockpile Stewardship, an earlier term for the Stockpile Stewardship Program discussed below] *is to predict the life of the components so that remanufacture may be scheduled, and results to date indicate a margin of surety extending for decades.*
>
> —Sydney Drell et al.
> JASON Program Office

We can argue that there is no need to begin a recapitalization effort in the near term. If we adopt the Defenders' point of view, nuclear weapons are only useful as a deterrent that will "hopefully" never be used, and the specific capabilities of an individual weapon (yield, reliability, etc.) are not important. Improved relations with Russia have reduced the need for a large stockpile, and the United States' safe and reliable stockpile did not deter the terrorists on 11 September 2001 (9/11).

In December 2001, Pres. George W. Bush and Pres. Vladimir Putin announced a plan to reduce the number of operationally deployed warheads to 1,700–2,200 by 2012 (codified in the Moscow Treaty).[1] An investment in replacement or new nuclear weapons now could be interpreted as the beginning of a new arms race and could actually damage US nonproliferation efforts. At an arms control conference, Sen. Ted Kennedy stated, "We reap what we sow, and if we brandish our nuclear weapons, we only encourage other nations to develop their own."[2] This chapter discusses the factors supporting the status quo arguments.

The Stockpile is Safe and Reliable

On 23 September 1992, the United States conducted an underground test, code-named "Divider." It was the last test conducted before adopting a moratorium on underground testing. This legislation was codified in the FY-93 Energy and Water Development Appropriations Act, which placed strict limits on the number and purposes of US nuclear tests and established an initial nine-month moratorium on nuclear testing—a ban that remains in effect today.[3] Since then, the United States has invested several billion dollars in nuclear weapons research to ensure the continued reliability and safety of its stockpile. This effort has greatly improved the understanding of the health of the existing stockpile. Amb. Linton Brooks stated in congressional testimony in April 2005:

> [T]oday *stockpile stewardship is working*, we are confident that the stockpile is safe and reliable, and there is no requirement at this time for nuclear tests. Indeed, just last month, the Secretary of Energy and Secretary of Defense reaffirmed this judgment in reporting to the President their ninth annual assessment of the safety and reliability of the U.S. nuclear weapons stockpile. . . . Our assessment derives from ten years of experience with science-based stockpile stewardship, from extensive surveillance, from the use of both experiments and computation, and from professional judgment.[4]

The SSP spends almost $6 billion per year to maintain the US nuclear deterrent without resorting to underground testing. SSP activities fall into three categories: (1) stewardship campaigns, including underlying scientific and engineering work; (2) directed stockpile work, which comprises the work being done on each specific weapon type; and (3) readiness in technical base and facilities (RTBF), which includes major facilities and infrastructure. The SSP campaigns are of three basic types, all related to primary certification, secondary certification, and nonnuclear components. SSP relies on a surveillance program where subsets of warheads of each type are closely examined each year for changes. Current observations from the surveillance program are used to assess future effects of aging and proactively identify corrective actions, if required. For the past 10 years, the National Nuclear Security Administration's (NNSA) SSP has reported successful maintenance of the US nuclear stockpile. While this paper does not question this as-

sertion, the only way to determine whether the stockpile will perform as designed is through a full-yield nuclear test. SSP focuses on the following elements:

- science-based understanding of the behaviors of warheads throughout their life cycles,
- provision for limited-life components to meet day-to-day sustainment requirements,
- stockpile surveillance,
- no new nuclear testing beyond subcritical, and
- LEPs to extend the service life of warheads/bombs.

The underlying goal of an LEP is to minimize changes while ensuring continued reliability and safety of a system. The W87 nuclear warhead was the first system to be refurbished through an LEP; refurbishment was successfully completed in November 2004. The W87 LEP extended the weapon's life by 30 years.[5] The B61 and W76 are undergoing LEPs, with first production units of FY-06 and FY-07, respectively. Upon completion of these LEPs, a diverse portion of the stockpile will have extended lives of up to 30 years. These extensions could strengthen the argument that no other actions are required with respect to recapitalization of the legacy stockpile.

A Limited Role for Nuclear Weapons

Before any additional investment can be made in producing replacement nuclear weapons, we must describe, in broad terms, the threat environment and the capability required to successfully deter aggression. In making the case for the status quo, the view of the Defenders is most applicable—nuclear weapons are useful as a deterrent against hostile nation-states. Using this reasoning as the baseline for the status quo argument, what is the role of nuclear deterrence in dealing with the security challenges of the twenty-first century, and how do these weapons fit into the current and future strategy?

Deterrence

It is important to have a common understanding of *deterrence* as it is used in this paper. Deterrence is not new; Carl von Clausewitz stated in his seminal work, *On War*, "If the enemy is to be coerced you must put him in a situation that is even more unpleasant than the sacrifice you call on him to make."[6] A former president of Sandia National Laboratories (SNL) provided a slightly different definition of deterrence, specifically expounding on fear:

> Deterrence is thus a process that forces adversaries to carry out *self-bargaining* about the worth of taking certain actions. Although we desire any rational calculations about a future state to caution against aggressive actions; to be most effective, deterrence must create real fear in the mind of the adversary—fear that he will not achieve his objectives, fear that his losses and pain will far outweigh any potential gains, fear that he will be punished. It should ultimately create the fear of extinction—extinction of either the adversary's leaders themselves or their national independence, or both. [7]

A National Defense University workshop on information warfare and deterrence reached consensus on the definition for deterrence as, "prevention or discouragement, by fear or doubt, from acting." The workshop defined a set of conditions for successful deterrence that included:

1. A threat to something of value that exceeds the perceived gain of noncompliance.
2. A clear statement of the behavior to be avoided or performed.
3. Clear and unambiguous communication of the threat and the desired or proscribed behavior to the target.
4. Credible threat, meaning that the actor is perceived by the target to have the will and capability to execute the threat.
5. Situational constraints that make it impossible for the target to avoid punishment.
6. Controllability of the threat and its implications by the actor.[8]

These definitions establish a common framework for discussing deterrence as highlighted in *The National Defense Strategy of the United States of America* (*NDS*). The *NDS* describes four means of accomplishing the defense strategic objectives. This paper highlights two of these, both related to deterrence.

Dissuade potential adversaries. We will work to dissuade potential adversaries from adopting threatening capabilities, methods, and ambitions, particularly by developing our own key military advantages.

Deter aggression and counter coercion. We will deter by maintaining capable and rapidly deployable military forces and, when necessary, demonstrating the will to resolve conflicts decisively on favorable terms.[9]

Deterrence is much more complicated in the current threat environment than in the bipolar world of the Cold War. First, there is the need to threaten something of value and instill a fear of extinction, which may differ for each adversary. Therefore, deterrence has to be tailored to individual threats and situations. Deterring a nation-state from using or selling nuclear weapons may be significantly different from deterring a terrorist from using a single WMD against a US city. This does not mean that a terrorist cannot be deterred, but it is obviously more difficult. For example, Doron Almog described cumulative deterrence and the challenging similarities Israel and the United States face in combating terrorism:

> In early 2003 an Israeli agent in the Gaza Strip telephoned Mustafa, a wealthy Palestinian merchant in Gaza, to inform him that over the previous three months his son Ahmad had been preparing for a suicide bombing mission in Israel. Mustafa was told that if his son followed through with his plans, he and his family would suffer severe consequences: their home would be demolished, and Israel would cut off all commercial ties with Mustafa's company. Neither he nor the members of his family would ever be permitted to enter Israel again. Faced with this ultimatum, Mustafa confronted his son and convinced him that the cost to his family would far outweigh any possible benefits his sacrifice might have for the Palestinian people.[10]

The fear of extinction was communicated, and the potential adversary was dissuaded from following through on his suicide bombing mission.

Role of Deterrence

There has been considerable debate on the doctrine of mutually assured destruction (MAD) and the requirement for a large, capable stockpile as a deterrent in the post–Cold War environment. Facing the overwhelming size of the Soviet army following World War II, the United States threatened to use nuclear weapons to deter Soviet aggression against North Atlantic Treaty Organization (NATO) countries and other US allies. The MAD doctrine is no longer applicable. In congressional testimony, then Undersecretary of Defense for Policy Douglas J. Feith said, "Most especially, it [Nuclear Posture Review] recognizes that Russia, unlike the Soviet Union, is not an enemy. There is ground for mutual cooperation, and the United States is seeking to move beyond the outdated Cold War nuclear confrontation to develop a new strategic framework with Russia."[11] The United States now faces a dramatically different strategic security environment with more unknowns and no clear near-peer nuclear competitor (though many in the Aggressor camp worry about China). Using the Defenders' point of view that nuclear weapons' utility is deterrence, the argument that the status quo (or smaller) stockpile is sufficient is strengthened.

While still having to prepare to defeat a nation-state, the United States must also face a different enemy that, in many cases, is far more dangerous. Discarding specific instances, such as the Israeli example above, a case can be made that deterrence will not influence a terrorist or rogue nation. Cong. David Hobson asked, "What is the deterrent value of our nuclear stockpile for the threats of the 21st century? Other than a Cold War 'Russia gone bad' scenario, I do not believe that our nuclear stockpile is useful against our new foes. . . . Has our current inventory of nuclear weapons dissuaded North Korea from building nuclear weapons? Is Iran being dissuaded from developing nuclear weapons capability by our massive stockpile? These are rhetorical questions because we all know the answer is no."[12] Therefore, in discussing deterrence, should nuclear weapons be used to deter the use of all WMD or only nuclear weapons?

All WMD Are Not Equal

The term *weapons of mass destruction* includes chemical, biological, radiological, and nuclear weapons. Based on the number of deaths expected from a nuclear weapon, Allison Mcfarlane posits that all WMD are not equal and urges caution in establishing US nuclear weapons policy against the generic term *WMD.*[13] Chemical attacks could produce thousands of casualties. Biological weapons could produce millions of deaths, but this is based on a worst-case assumption and may not consider the response capability of the US public health system. However, the destructive potential of a nuclear weapon places it in a class of its own. Even before 9/11, experts warned of the impact of a terrorist acquiring a nuclear weapon. Wolfgang Panofsky stated, "It is estimated that if a nuclear device were detonated in a populous American city, it would kill hundreds of thousands of people, and the economic impact would approach $1 trillion."[14] By comparison, the terrorists' use of sarin gas in Tokyo in 1995 caused 12 deaths and hospitalized more than 5,000 people.[15]

Defenders argue that the United States could not withstand the worldwide horror that would result from its use of a nuclear weapon against an entity that attacked with a nonnuclear WMD. This attitude severely limits the deterrence of nuclear weapons and reduces the requirements for possible new weapons. Added to this argument are findings of the Nuclear Posture Review (NPR) submitted to Congress in January 2002.[16]

Nuclear Posture Review

The 2002 NPR findings reflect a new era for the effectiveness of nuclear weapons as a deterrent. While maintaining the importance of nuclear weapons, this reasoning acknowledges that the future threat environment is difficult to predict. To better address future threats, the original nuclear triad of land-based intercontinental ballistic missiles (ICBM), submarine-launched ballistic missiles (SLBM), and bomber forces delivering nuclear weapons has been replaced with a new triad (see figure 1).

When evaluating the new triad, a defender may conclude that nuclear weapons are devalued. Although the United States

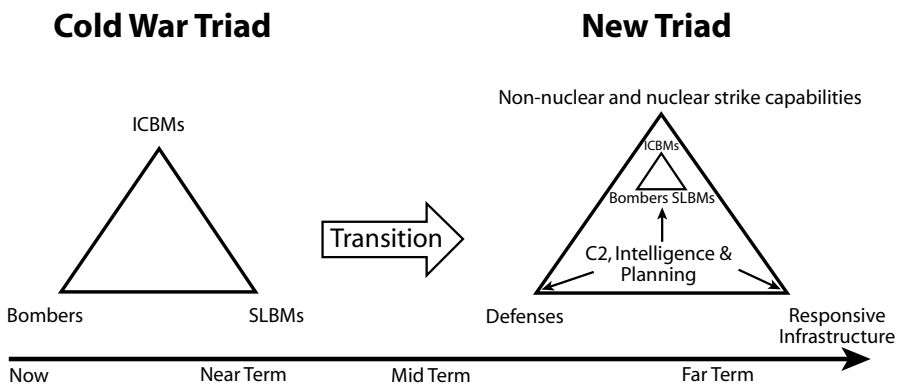

Figure 1. The new triad (Reprinted from DOD, "Findings of the Nuclear Posture Review," 9 January 2002, 9.)

maintained a triad based on different delivery modes for nuclear weapons for nearly 50 years, the two major components of the new triad are defenses and responsive infrastructure. Also, strike capabilities are both nuclear and nonnuclear. Deputy Secretary Feith highlighted the need to transform these capabilities when he stated,

> Instead of our past primary reliance on nuclear forces for deterrence, we will need a broad array of nuclear, nonnuclear and defensive capabilities for an era of uncertainty and surprise. The United States will transform its strategic planning from an approach that has been based almost exclusively on offensive nuclear weapons, to one that also includes a range of nonnuclear and defensive capabilities. In particular, because deterrence will function less predictably in the future, the United States will need options to defend itself, its allies and friends against attacks that cannot be deterred.[17]

Nuclear weapons present another tool to achieve US defense objectives. Investments in nuclear deterrence could come at the cost of conventional defense investments. Another NPR key point was validation of reducing the operationally deployed strategic nuclear forces by 1,700 to 2,200 warheads by 2012 as codified in the Moscow Treaty.[18]

The case for status quo (or smaller) includes use of nuclear weapons for deterrence, acknowledgement that deterrence will be more difficult or may not be effective against terrorists and/

or rogue nations, a reflection that US strategic capabilities are no longer limited to nuclear-only but include defenses and infrastructure, reduction in numbers of warheads that could go even lower, and expectation of cost savings with a smaller force. The addition of responsive infrastructure to the triad is key in any discussion of modernizing or recapitalizing the nuclear force.

Responsive Infrastructure and Replacement Warheads

The NWC includes two physics design laboratories (Los Alamos National Laboratory [LANL] in New Mexico and Lawrence Livermore National Laboratory [LLNL] in California), one engineering laboratory (Sandia National Laboratories, with campuses in California and New Mexico), four production plants (the Pantex Plant in Amarillo, TX; the Y-12 Plant in Oak Ridge, TN; the Kansas City Plant in Kansas City, MO; and the Savannah River Site in Savannah River, SC), and the Nevada Test Site. The fall of the Soviet Union, the moratorium on nuclear testing, and the halt in new nuclear weapons production for more than 10 years has severely reduced this infrastructure (e.g., closures of Rocky Flats, Mound, and Pinellas facilities). At the same time, investments in the remaining supporting infrastructure have declined. In the immediate post–Cold War period, the nation invested in SSP tools and technologies to counteract the loss of underground testing and to improve the understanding of weapons physics so that decision makers could make informed decisions on the pace and the scope of refurbishing and/or remanufacturing nuclear weapons and their components. Now the infrastructure needs to be transformed to bring it up to modern production standards.

Achieving a political consensus on investing additional funding in the nuclear weapons infrastructure will be very difficult. Pressure on discretionary funding will increase as the United States faces an aging population and rising health care and Social Security costs. Rising interest rates, coupled with increasing deficits and long-term national debt, will compound these problems. The Government Accounting Office highlighted these issues in a February 2005 report that looked in depth

at two scenarios. The first, optimistic assessment is a fiscally restrained scenario, in which discretionary spending grows at the rate of inflation over the next 10 years and all existing tax cuts expire (figure 2).

Figure 2 shows that without significant change, all other funding—including Department of Defense (DOD) and Department of Energy (DOE) funding for nuclear weapons—will be

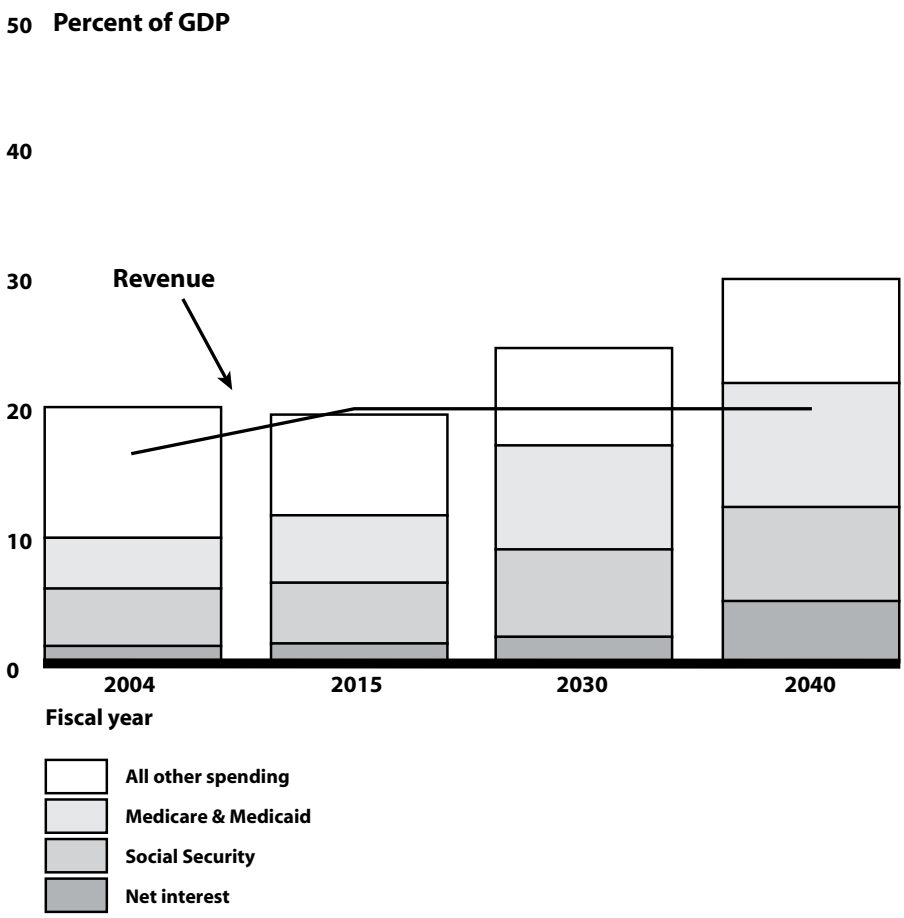

Figure 2. Spending as a share of GDP under baseline extended (Reprinted from Government Accounting Office [GAO], *21st Century Challenges, Reexamining the Base of the Federal Government*, GAO-05-325SP [Washington, DC: GAO, February 2005], 7.)

overshadowed by nondiscretionary funding and interest on the national debt. While one cannot assume that this issue directly relates to cuts in future DOD and DOE budgets, it can be assumed that significant pressure will be applied to reduce budgets wherever possible. If discretionary funding is allowed to grow with the gross domestic product (GDP) and the expiring tax cuts are extended, funding available for national defense will decrease, as shown in figure 3.

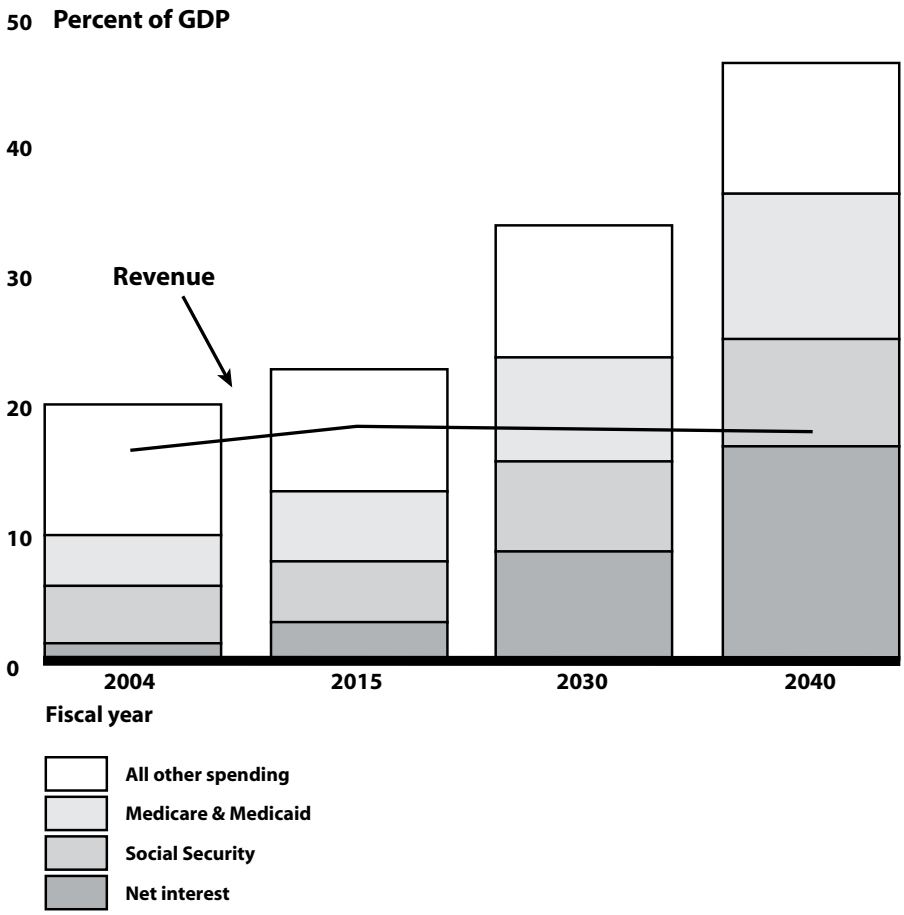

Figure 3. Spending as a share of GDP assuming discretionary spending grows with GDP after 2005 and all expiring tax provisions are extended
(Reprinted from GAO, *21st Century Challenges*, 8.)

Again, in making the case for the status quo (or smaller), it cannot be directly concluded that future nuclear weapons budgets will not accommodate investments beyond current budgets. However, there is empirical evidence that initiating new programs at added cost will be very difficult. Near-term defense budgets are already under pressure to reduce. As the *Wall Street Journal* reported in November 2005, "The Pentagon has asked the military services to prepare to cut as much as $8 billion from the 2007 defense budget and about $32 billion over the next six years as it girds for a period of serious belt tightening."[19] The article adds that further cuts may be forthcoming. Budget problems are severe enough that unless consensus can be gained for investment, future budgets increases are highly unlikely.

The Defenders' final argument for maintaining the status quo concerns issues with fielding a new warhead. Assuming that previously discussed concerns can be overcome, there will still be a significant public debate on the production of a new warhead and its potential impact on proliferation. Defenders argue that it will be more difficult to stop other nations from acquiring nuclear warheads if the United States develops more. In discussions concerning the issue of replacement warheads, Robert Civiak, a former visiting scientist at the LLNL, described the effort as embarking on a "slippery slope," which would damage national security by diminishing the pressure that could be exerted on Iran and North Korea to halt their nuclear weapons efforts.[20] Defenders also question the wisdom of investing in a new warhead when nuclear weapons have not been used in the last 60 years and express concern that producing a new weapon violates the US commitment to the Nuclear Non-Proliferation Treaty (NPT).

Finally, production of a replacement warhead could reverse the warming of relations with Russia, returning to a cold war. To highlight the sensitivity of the United States' relationship with Russia, the press reported on a draft joint publication on nuclear operations doctrine, Joint Publication (JP) 3-12.[21] This draft publication included a provision that appeared to lower the threshold for the use of nuclear weapons preemptively against an enemy using WMD. In response, Reuters quoted Russian defense minister Sergei Ivanov as saying, "Lowering

the threshold for use of atomic weapons is in itself dangerous. . . . Such plans do not limit, but in fact promote, efforts by others to develop (nuclear weapons)."[22] Although the NPR officially acknowledged a new strategic partnership with Russia, this draft publication generated a rebuke from Russia.

Summary

The argument to maintain the status quo (or smaller) is strong. If one accepts the primary argument for nuclear weapons as a deterrent, future threat environments without a near-peer will reduce the reliance on nuclear weapons. In addition, the NPR's apparent devaluation of nuclear weapons and the recognition that future budgets will be highly constrained give the status quo argument additional traction. Finally, supporters of this alternative argue that building new weapons actually makes the United States less secure by increasing the incentive for others to develop nuclear weapons. All these factors lead to the Defenders' conclusion that, faced with what is known today, new weapons and investments in the NWC are not warranted. However, faced with an uncertain future, the United States must have the ability to respond in a timely manner. The Defenders' views are valid, but does the United States have enough capability and sufficient ability to respond to future, unknown threats? These questions become key factors that drive the need to recapitalize the legacy nuclear weapons sooner rather than later.

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18. *Treaty on Strategic Offensive Reductions*, 24 May 2002.

19. Greg Jaffe and Jonathan Karp, "Pentagon Girds for Big Spending Cuts," *Wall Street Journal*, 4 November 2005, 3.

20. Robert Civiak, *The Reliable Replacement Warhead Program: A Slippery Slope to New Nuclear Weapons* (Livermore, CA: A Report for Tri-Valley CAREs, January 2006), 1.

21. Walter Pincus, "Pentagon Revises Nuclear Strike Plan—Strategy Includes Preemptive Use against Banned Weapons," *Washington Post*, 13 September 2005, A01.

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Chapter 3

The Case for Beginning Recapitalization Now

America is sleepwalking through history, armed with nuclear weapons. The Cold War left us with a massive inventory of weapons we no longer need, an infrastructure we can no longer use or maintain, and no thought of where our future lies. A shrinking community of nuclear experts holds on to a massive and aging inventory as a security blanket for a future they cannot define.

—John J. Hamre
Former Deputy Secretary of Defense

Nuclear weapons continue to be key elements of the integrated *National Military Strategy*[1] and will remain part of the overall US security structure well into the future. Dr. John Hamre outlined the importance of a nuclear strategy, noting, "First, there is an important reason the United States must have nuclear weapons: Other nations have them, and more seem to want them. We still must deter potential opponents, avoid nuclear intimidation by other powers and prevent strategic surprise by aspirant nations."[2] To ensure the United States retains this capability in the future, specific activities must be initiated now for the following reasons:

1. The stockpile is aging. While several studies are designed to interpret the impact of aging, these studies also reveal the risks of stockpile aging.
2. SSP cannot continue indefinitely in its present form. The Livermore, Los Alamos, and Sandia National Laboratories produced a report on sustaining the nuclear enterprise which states, "The Stockpile Stewardship Program (SSP) has successfully maintained the nuclear weapons stockpile for more than a decade, since the end of nuclear testing. However, as we project forward, the current application of SSP looks increasingly unsustainable."[3]
3. The threat environment has changed.

The military is often accused of planning for the next war the way it fought the last one. Both supporters and detractors have adopted this argument in discussing nuclear weapons. Defenders argue that large, diverse stockpiles are a throwback to the Cold War. Aggressors counter that the United States must evaluate both current and potential future threat environments and understand the capabilities required of the nuclear stockpile, potentially including new nuclear capabilities. The Gamblers' argument appears to be the most constructive and can be categorized as a risk-management hedge: faced with uncertain and highly dynamic future threat environments, the United States needs to maintain a sufficient nuclear capability, which requires taking action now.

Future Role for Nuclear Weapons

Before discussing recapitalization issues, the larger question is: What role is envisioned for nuclear weapons? This question appropriately raises the debate to a higher level and moves away from counting specific weapons types. Dr. Hamre stated, "This is an area in which we need to scrap the past and start from scratch. The time for sleepwalking is indeed over."[4] Several worst-case scenarios suggest a nuclear response *option* may be required. For this discussion, three different scenarios are presented that theoretically could include a nuclear option.

The first worst-case scenario is the buildup of nuclear weapons capability by a near-peer nation-state, called Country X. Country X has publicly opposed the United States and is a recognized potential threat. The United States has high confidence that Country X has an emerging nuclear capability and a stated intent to use that capability to achieve its political goals. What nuclear capability does the United States require in this situation? This could lead to the Defenders' conclusion—a sufficient deterrent capability (adequate stockpile) with a clear declaratory policy if the United States or its allies are attacked with nuclear weapons.

The second worst-case scenario is the buildup of a WMD capability by a rogue nation or terrorists, called Organization Y. The United States learns that Organization Y plans to use WMD against a US city, and the WMD production facility is buried

deeply in a mountain. Advisors to the president assert that only a preemptive strike with a nuclear weapon has a high probability of successfully destroying the WMD, albeit with significant political issues associated with the "first" use of a nuclear weapon. What nuclear capability is required in this scenario? The Aggressor approach may be more applicable. A possible war-fighting use of a nuclear weapon that minimizes collateral damage and ensures a high-probability kill is required—a different capability than currently exists in the legacy stockpile.

The final worst-case hypothesis is the response after a WMD has been used against a US city, with massive casualties. The United States identifies the organization, Organization Z, and location of the sponsor of the attack. Organization Z is located in a country sympathetic to its cause, but the country's government is politically separate from Organization Z. US policy before the attack was that it would respond to a WMD attack with overwhelming force, both against Organization Z and its host country. The president faces the decision to launch a retaliatory strike against the leadership of Organization Z. The military target is a command center buried deeply in a mountain that also is suspected of housing a WMD production center. What nuclear capability does the United States require in this scenario? In this case, the Gamblers' perspective is most instructive. It provides the president with a range of responses—both conventional and nuclear, kinetic and nonkinetic. Destruction of the target will be weighed against the collateral damage caused by overwhelming force. To further highlight this scenario, French president Jacques Chirac noted, "The leaders of states who would use terrorist means against us, as well as those who would envision using . . . weapons of mass destruction, must understand that they would lay themselves open to a firm and fitting response on our part. . . . This response could be a conventional one. It could also be of a different kind."[5]

These hypotheses highlight some of the complexities of the potential decisions. For one case, multiple high-yield warheads might be required. In other cases, a different capability might be more appropriate. The NPR anticipates a spectrum of responses for the future employing both defensive and offensive forces. The United States' ability to respond to new threats will be directly related to the weapons produced in

anticipation of the threat, defensive abilities to thwart the threat, and the ability to develop and produce new weapons in response to the threat. The infrastructure and capability inherent in the NWC is a critical enabler. While there may be warnings that the world scenario is changing, there may not be sufficient time to ramp up a new production complex before an action is required.

Nuclear Weapons Needed for the Foreseeable Future

Critics of using nuclear weapons as a deterrent have argued that the United States can unilaterally eliminate its nuclear stockpile and point to its acceptance of Article VI of the Nuclear Non-Proliferation Treaty, "pursue negotiations in good faith on effective measures relating to cessation of the nuclear arms race at an early date and to nuclear disarmament."[6] Supporters of unilateral nuclear disarmament reference the US decision to forego development and maintenance of other WMD such as chemical and/or biological weapons as support for their position. It is instructive to look at the recommendations concerning that decision. In the interdepartmental report to the National Security Council asking the question, "Should the US maintain the capability to retaliate with lethal chemical agents?" the response included the following statements:

1. The principal argument against the development and stockpiling of lethal chemical capability is that other military means, including a whole range of nuclear weapons, are sufficient to deter the use of lethal chemicals.

2. The deterrent threat of retaliation with nuclear weapons against a CW attack could be more credible if the US were to eliminate its CW capability.[7]

Nuclear weapons are the only WMD–deterrence tool available to the United States—a key consideration in the decision to forego development of an offensive chemical and/or biological weapons capability.

The NPR submitted to the Congress in January 2002 reiterated the requirement for nuclear weapons. Gen John Gor-

don, USAF, retired, stated during testimony on the NPR, "the NPR reaffirms that nuclear weapons, for the foreseeable future, will remain a key element of US National Security Strategy."[8] Even though the number in the stockpile may decrease, as long as nuclear weapons exist, the United States will have nuclear weapons. This view is apparently shared by Russia, where its minister of defense was quoted as saying, "At the same time, Russia does not intend to give up its nuclear capability as it is still a key deterrent and a crucial instrument in protecting our national interests and achieving certain political objectives."[9]

The Nuclear Weapons Stockpile must be Maintained

If one accepts the premise that for the foreseeable future, the United States needs to maintain a nuclear weapons capability, then the discussion can focus on how best this can be accomplished while reducing the risk of future uncertainties. As discussed in chapter 2, the existing stockpile can be maintained (potentially, well into the future) to provide a significant deterrent capability. What are the risks of maintaining the legacy stockpile? Are there other activities that should be accomplished to reduce the risks?

Stockpile Stewardship Program Concerns

There is broad agreement that the stockpile is safe and reliable—today. What steps should the United States take to plan for uncertainties tomorrow? From the Gamblers' point of view, what steps should be taken to ensure a sufficient nuclear capability can be maintained while minimizing the risk of a future problem with the existing stockpile?

The technical community has learned a great deal about nuclear weapons over the last 10-plus years, including uncertainties associated with aging systems. Uncertainty translates into risk when the performance of the current stockpile is evaluated. Reasonable risk-mitigation strategies can be taken to ensure the stockpile remains safe and reliable in the future. The first step is to understand the risks.

Risk—Life Extension Programs Result in "Modified" Warheads

Some portions of the NWC that built the original stockpile no longer exist. The Rocky Flats plant in Colorado (which produced the pits used in nuclear weapons) and the Rocky Flats nuclear operations were shut down in 1989. The Mound plant in Ohio (which produced high-power detonators) and the Pinellas plant in Florida (which produced neutron generators and thermal batteries) closed in September 1994. Depending on the warhead and the subsystem, production processes and materials cannot be duplicated in all cases. This means that each time a warhead is life-extended, there is a risk that small changes in processes or rebuild materials cannot be duplicated so that it is no longer an exact duplicate of the as-tested system.

While scientists and engineers continue to test (conventionally) and simulate as much as possible, life-extended warheads are different from the originals. The engineers and scientists are required to provide a confidence level that the life-extended warhead will perform like the tested warhead. In his congressional statement advocating that the US Senate not ratify the Comprehensive Test Ban Treaty (CTBT), Dr. John Foster said, "It is now the responsibility of the weapon designers to use their best techniques to judge which changes are acceptable and which are not. This is a judgmental matter; with care, the likelihood of error is small but will always be there unless the judgments can be tested. I would expect that as time goes on mistakes will be made and deficiencies in our untested stock would grow in and eventually we will probably have an unreliable stockpile."[10] Dr. Foster argued that ultimately, maintaining the existing stockpile will require a nuclear test to ensure reliability. The amount of risk that can be tolerated will be case and weapon system dependent. A key point to consider: if the world situation ever deteriorates to the point that a US president is confronted with having to authorize the use of a nuclear weapon, that weapon must function as designed. The United States can take steps now to mitigate this risk and ensure the necessary confidence level that the warhead will function as designed, even 20, 30, 40, or 50 years from now.

Risk—Assessing the Stockpile

Nuclear weapons scientists and engineers are limited in how accurately they can model and simulate the effects of stockpile aging. Dr. Foster notes, "The current generation of nuclear weapons in the US stockpile have been optimized to produce the maximum yield in the smallest size, lightest weight and still be safe. Think of them as devices that have been tuned as much by trial and error as by calculations. As a consequence their performance is very sensitive to small changes in material properties, shapes and masses."[11] Confidence that the warhead would function as designed was gained through nuclear testing—an option no longer available as the United States continues to adhere to a testing moratorium. To mitigate risk, the design labs carefully review archived test data to glean additional data to support ongoing analysis efforts. Each time a warhead is dismantled or examined as part of the surveillance process, there is a chance that the scientists and engineers will be confronted with a first-of-a-kind problem that has no readily identified solution. If such a problem cannot be resolved using the SSP tools, thus providing the level of confidence currently required for certification, nuclear testing could be required. In other words, the national laboratory responsible for certifying the safety and reliability of the warhead may not be able to do so within the currently agreed upon error bounds. This could result in a decision point: accept a higher probability that the warhead may not function as expected (i.e., lower yield), conduct a nuclear test to characterize the performance, or withdraw all warheads/bombs of that class from the stockpile.

Risk—Loss of Nuclear Weapons Design Experience

The current stockpile is critically dependent on an aging workforce that is rapidly approaching retirement or has already retired. Many areas associated with nuclear weapons design and production require education as well as experience. The criticality of nuclear weapons experience was highlighted in the FY-00 Report of the Panel to Assess the Reliability, Safety, and Security of the United States Nuclear Stockpile.

Confidence has always been a judgment—a determination that the nuclear stockpile will perform reliably to specifications and hence provide a credible deterrent capability. Sustaining confidence requires continued assurances of weapon safety and reliability based on painstaking surveillance along with quantitative and qualitative assessments of stockpiled weapons. It also requires trust in the people, tools, and methods used to find, assess, and fix problems in the stockpile. This trust today relies heavily on experienced weapon designers, scientists, engineers, and production personnel, as well as the extensive test database for existing weapons. The skepticism, diligence, and perseverance of today's stockpile stewards have been sharpened by the surprises they have encountered through nuclear testing and other experiments. Their experience and resulting attitudes reinforce the trust that national leaders place in their assurances that the stockpile is safe and reliable.[12]

A robust nuclear capability requires a workforce whose experience combines both a theoretical and a testing approach to nuclear weapons design and performance. Maintaining the status quo does not address this need. Are there additional actions that can be taken to mitigate this risk and ensure a robust future technical workforce?

Future Threat Environment is Uncertain

Yogi Berra is quoted as saying, "It's tough to make predictions, especially about the future." Planning must include the possibility that nuclear weapons may be needed and used in the future. Because nuclear weapons have not been used in a conflict for more than 60 years, some believe there is a nuclear taboo, and the United States will not use them in the future. While this is clearly hopeful, it is both impractical and shortsighted to plan for the United States' defense against this background.

Nuclear Taboo to Shape Policy?

Nina Tannenwald discusses the origin of the nuclear taboo and says,

> In reality, however, nuclear weapons have come to be defined as abhorrent and unacceptable weapons of mass destruction, with a taboo on their use.

> This taboo is associated with a widespread revulsion toward nuclear weapons and broadly held inhibitions on their use. The opprobrium has come to apply to all nuclear weapons, not just to large bombs or to certain types or uses of nuclear weapons. It has developed to the point that uses of nuclear weapons that were once considered plausible by at least some U.S. decisionmakers—for example, tactical battlefield uses in limited wars and direct threats to deter enemies from conventional attack—have been severely delegitimized and are practically unthinkable policy options.[13]

There is a belief that any nation that uses a nuclear weapon first will face almost worldwide criticism, no matter the reason for its use. Over time, the use of a nuclear weapon may become even more difficult, to the point that it is impossible to imagine a scenario where a nuclear weapon would be used. Clearly, nuclear weapons could have been used in extreme crises in the last several decades, but in the end were not.

For example, during the Cuban missile crisis, the United States and the Soviet Union (USSR) experienced a military confrontation that could have escalated to a nuclear confrontation. Pres. Richard M. Nixon did not use nuclear weapons in Vietnam or during the Yom Kippur War. The USSR did not use nuclear weapons against Afghanistan. In all these cases, the potential for escalation existed. Can the United States make future stockpile decisions based on the nuclear taboo and belief (hope) that they will never be used?

In the Spring 2005 *Naval War College Review*, George Quester states that the United States has been reluctant to consider the consequences of the next use of nuclear weapons in anger. To identify possible policy responses, he discusses three likely scenarios: escalation between India and Pakistan, action by North Korea, and a terrorist attack on the United States. He says, "As we look forward to the prospect of nuclear weapons use, however, we must consider some *real* uses of such weapons, intended to cripple or destroy real targets, not merely to deter or compel opposing-party behavior."[14] Details of *real* uses of nuclear weapons are not further discussed in this paper. However, future stockpile decisions must address the practical uses of nuclear weapons and the chance that they will actually be used.

Nuclear Weapons Planning Considerations

In the 1950s, nuclear weapons were developed to counter the significant conventional forces of the USSR. The United States'

European allies were concerned that a massive Soviet conventional attack could quickly overwhelm existing defenses. The US response was the development of nuclear weapons that could be used to slow/stop a conventional Soviet advance and in the end, make it impossible for the USSR to achieve any goal of attacking US allies. The concepts of deterrence and containment were honed during this period.

US future force planning must include the worst-case scenarios and a risk/benefits analysis that includes probabilities and possible responses. Because the future security environment is difficult to predict, the need to use nuclear weapons and the capabilities they provide must be contemplated.

Nuclear Weapons Complex Transformation

Transforming the NWC raises the following questions:

- What is the underlying strategy for United States national security in the twenty-first century?
- What role do nuclear weapons have in that strategy?
- What type and how many weapons are required to support that strategy?
- What future capabilities are required of the NWC (i.e., after the transformation)?

A complex that maintains the current stockpile indefinitely with no new production will be very different from a complex that produces and supports new warheads. To meet the NPR requirements of a responsive infrastructure, the NWC must be flexible, able to maintain the existing stockpile, and potentially produce new or modified warheads. The NWC already maintains the current stockpile through the LEPs. What changes are required of the NWC to produce a replacement warhead? To achieve transformation, the NWC needs a forcing function—a way to identify areas that require modernization. Requiring the NWC to design and manufacture a replacement warhead would provide data on deficiencies within the nuclear weapons design and production complex. The Reliable Replacement Warhead

(RRW) appears to be a worthy driver for complex transformation, as discussed in chapter 4.

Summary

Technical experts disagree on whether the future risks of aging effects on the stockpile can be remedied following the existing SSP or whether wholesale stockpile replacement is more appropriate. Risk is associated with continuing the LEPs but not transforming the NWC to better respond to future threats. Although the security environment has changed since the end of the Cold War, the US stockpile has not been updated to reflect those changes. There are questions on whether warheads designed for the Cold War are credible deterrents for rogue states and terrorists. Does the current stockpile provide a credible deterrent, or do other nations believe that the United States does not have the will to employ nuclear weapons to deter, dissuade, or ultimately defeat an attack on its territory? Regardless of whether the current stockpile can be maintained indefinitely, does it forcefully and reliably support national security goals and objectives? An effort to transform the existing stockpile and drive the NWC toward a responding infrastructure must begin soon—leveraging the experience from the nuclear weapons engineers and scientists and exercising the existing infrastructure to identify weaknesses.

Notes

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Chapter 4

Future Nuclear Force Structure Considerations

If you don't know where you are going, you might wind up someplace else.

—Yogi Berra
Former major league baseball player

Both the NPR and the Moscow Treaty provide the foundation of the future US nuclear force structure. The NPR describes a new triad of tools for response to future strategic threats, to include conventional and nuclear strike options, defense, and an infrastructure that can be quickly adapted to respond to future unknowns. The Moscow Treaty provided an initial baseline of 1,700–2,200 operationally deployed warheads in 2012. Within this framework, what should the nuclear stockpile look like in the future? Building upon the argument that now is the time to begin a recapitalization effort and enable a responsive infrastructure, the RRW program can be a catalyst for establishing the future stockpile.

Reliable Replacement Warhead—Catalyst for Change

The United States should be developing production processes for next-generation warheads, not optimizing maintenance for aging systems. Investments to maintain the existing stockpile should be weighed against a comprehensive vision of producing replacement warheads that could transform the NWC.

RRW Background

Transforming the infrastructure will require transforming the stockpile itself; the RRW is the most credible option for this change. In the 2005 Consolidated Appropriations Act, the Congress provided funds for a National Nuclear Security Administration tri-lab initiative to determine the feasibility of designing, certifying, and manufacturing an RRW. In testimony to Congress, Amb. Linton F. Brooks described the RRW program:

> With the support of Congress, we are beginning a program—the Reliable Replacement Warhead (RRW) program—to understand whether, if we relaxed warhead design constraints imposed on Cold War systems (that have typically driven "tight" performance margins in nuclear design) we could provide replacements for existing stockpile weapons that could be more easily manufactured with more readily available and more environmentally benign materials, and whose safety and reliability could be assured with highest confidence, without nuclear testing, for as long as the United States requires nuclear forces.[1]

The Department of Energy further described the RRW program in its FY-07 budget submission: "The goal of the RRW study is to identify designs that will sustain long-term confidence in a safe, secure, and reliable stockpile and enable transformation to a responsive nuclear weapons infrastructure."[2] In April 2005, the Nuclear Weapons Council established a Joint Project Officers Group (JPOG) to conduct a feasibility study for an RRW that is designed for use on SLBMs and would be compatible with ICBMs. LANL is teaming with SNL/Albuquerque, and LLNL is teaming with SNL/Livermore to design an RRW that will improve the safety, security, certifiability, and manufacturability of existing US warheads and their components. The reports, due by August 2006, include certification and manufacturing plans, a risk assessment, an integrated project plan, a life-cycle cost assessment, and a clear explanation of how the proposed design would revamp the present weapons infrastructure to meet transitioning national security needs.

If the feasibility study is successful, RRW could replace expensive, aging warheads with a smaller stockpile that is safer and more secure, reduces the need for testing, and ensures a more responsive nuclear infrastructure. Ultimately, a successful RRW must also demonstrate cost savings over the total life cycle of the warhead. Most importantly, the RRW must provide the same or better confidence in certification without nuclear testing as has been demonstrated for the past 10 years through stockpile stewardship.

In testimony to the Senate Armed Services Committee, Ambassador Brooks highlighted concerns with the current stockpile:

1. It is the wrong stockpile technically;
2. It was not designed for longevity;
3. It may also be the wrong stockpile to meet the future military capabilities required;
4. It is the wrong stockpile politically; and

5. It is the wrong stockpile from a physical security standpoint.[3]

Application to Responsive Infrastructure is Critical

Secretary of Energy Samuel W. Bodman defined responsive nuclear weapons infrastructure:

> By "responsive" we refer to the resilience of the nuclear enterprise to unanticipated events or emerging threat, and the ability to anticipate innovations by an adversary and to counter them before our deterrent is degraded. Unanticipated events could include complete failure of a deployed warhead type or the need to respond to new and emerging geopolitical threats.[4]

> RRW is a critical enabler of a responsive infrastructure. Ambassador Brooks said, "Success in realizing our vision for transformation will enable us to achieve over the long term a smaller stockpile, one that is safer and more secure, one that offers a reduced likelihood that we will ever need to test again, one that reduces NNSA and DoD ownership costs for nuclear forces, and one that enables a much more responsive nuclear infrastructure."[5]

The current infrastructure must continue to maintain the existing stockpile, meaning that many processes and procedures duplicate production of 1970s/1980s technology. It is an extreme challenge to have a responsive infrastructure that is tied to old technology and materials. The challenge is to maintain old manufacturing expertise *and* transition to new, modern processes and materials. Figure 4 lists specific responsive infrastructure goals.

RRW will include production and material advances that simplify manufacturing. These changes will allow the infrastructure to initiate conversion to modern manufacturing processes while existing systems are maintained. While reductions have been made to the overall NWC (i.e., closure of Rocky Flats), the infrastructure has not been modernized to produce remanufactured weapons/RRWs. Producing RRWs will drive this transformation and provide a tangible step toward a responsive infrastructure.

Finally, timing of RRW is critical. Momentum within the NWC has been established with the RRW feasibility study and initial design data submittal of March 2006. Early indications are that a small congressional majority supports the RRW effort with the caveat that it provides no new nuclear capabilities. While paper studies and designs provide one level of confidence, the

Figure 4. Goals of a responsive infrastructure (Reprinted from John Harvey, "How Can the Nuclear Weapons Enterprise Itself Reinforce 'Assurance' and 'Dissuasion?'" presentation to 36th Annual IFPA- Fletcher Conference on National Security and Policy, Washington, DC, 15 December 2005, 7.)

NWC must produce an RRW on a specified schedule in order to (1) understand the challenges of creating a responsive infrastructure and (2) answer the following questions:

- Can the production plants actually manufacture RRW?
- Will the modern design improvements translate into production savings?
- How quickly can RRWs be produced?
- What existing production processes must be changed and how will those changes impact design?
- Can the weapons laboratories certify an RRW (to acceptable confidence levels) for entry into the stockpile without nuclear testing?

To answer these questions, it is critical that RRW is carried forward to demonstrate the entire proof-of-concept. A prototype RRW must be produced in order to identify infrastructure issues and define production schedules. Responsive infrastructure is the key to addressing uncertainties in future threats and ensuring a more reliable nuclear weapons stockpile.

Future Stockpile Characteristics

Mr. Steve Henry, the deputy assistant to the secretary of defense for nuclear matters, summarized the DOD vision for stockpile planning in terms of risk management. Figure 5 illustrates the reliance on a hedge of stockpile weapons to offset the limited capacity of the existing nuclear weapons infrastructure. With a responsive and efficient infrastructure, the stockpile could be reduced, thus reducing the need for a large stockpile for contingencies.

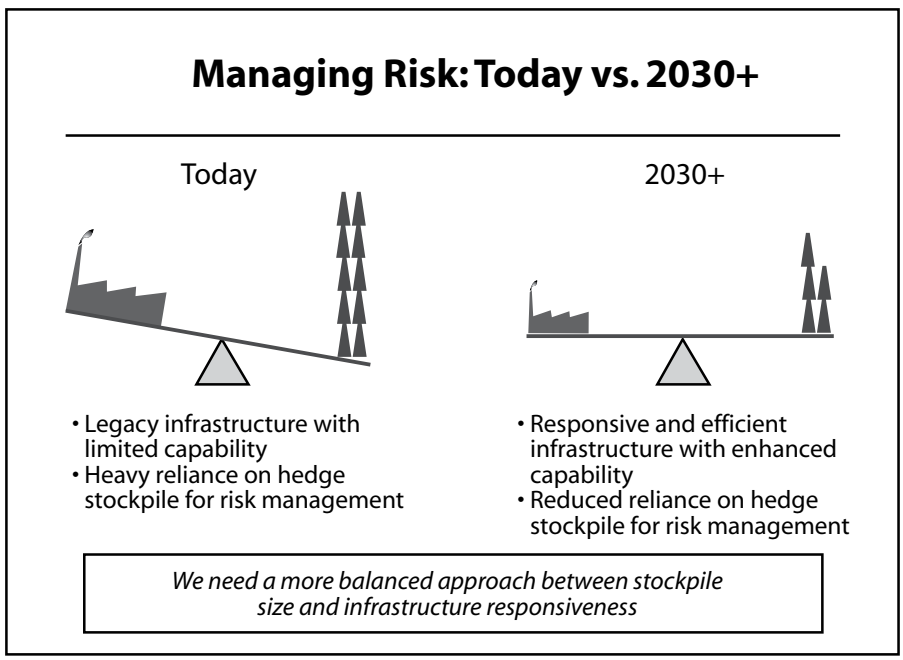

Figure 5. Managing stockpile risk (Reprinted from Steve Henry, "Stockpile Planning for the Future," presentation to 36th Annual IFPA- Fletcher Conference on National Security and Policy, Washington, DC, 15 December 2005, 8.)

In Senate testimony, Secretary Bodman said, "The combination of the Reliable Replacement Warhead and a responsive infrastructure—each enabled by the other—may genuinely be transformational."[6] However, as the infrastructure is transformed, advantages with the current stockpile should be maintained to include diversity.

Maintain Diversity in Warheads

System diversity is an advantage of the existing nuclear weapons stockpile. Each nuclear warhead system is different, manufactured at different times to meet different requirements, and in many cases, designed by different national laboratories. Therefore, if a problem is identified with a specific weapon or system, an alternative is available—other weapon systems are available until the problem is corrected. The result is an extremely low probability that a single issue could ground a class of weapons (ICBMs, SLBMs, or bombs), much less the entire nuclear stockpile. This diversity needs to be maintained in the future stockpile; however, the number of types of weapons should be reduced with the introduction of more reliable RRWs.

Assuming production approval of RRWs, the stockpile at midterm (2015–2030) will become a combination of RRW-type replacement weapons and legacy weapons. Reliable replacements could be designed for the various delivery systems (ICBMs, SLBMs, and bombs) using the same military characteristics and holding at risk the same targets as the ones they replace. As RRWs for the various delivery systems are designed and fielded, the weapons that are replaced can be retired. Additionally, specific portions of the nuclear weapons infrastructure—those that support only a retired weapon system—could also be retired. Beyond 2030, the stockpile should be primarily RRW-type systems. Producing "replacement" weapons will continue to exercise the infrastructure and enable it to respond to new/different threat environments. Diversity in the stockpile could take on a slightly different connotation and mean as few as three different systems to cover the three delivery systems—ICBMs, SLBMs, and bombs. This would result in significant life-cycle cost savings. This action is possible due to the higher confidence in the long-term reliability of RRWs.

Maintain Diversity in Delivery Systems

The old triad with warheads delivered by ICBMs, SLBMs, and bombers provides a flexibility that should be maintained in the near future. The triad originally grew from a bomber-only capability and incrementally added ICBMs and SLBMs. There are advantages in terms of flexibility (bombers can be recalled); immediacy to strike a designated target (ICBMs); and security from attack (SLBMs). Longer term, there may be opportunities to reduce a leg of the triad and eliminate a complete category of nuclear weapons. In its policy handbook, the CATO Institute recommends that policy makers should, "reduce the triad of U.S. nuclear forces—nuclear-capable bombers, intercontinental ballistic missiles (ICBMs), and sea-launched [*sic*] ballistic missiles (SLBMs)—to a dyad."[7]

This may not be a viable alternative today based on existing threats, but if the United States is less threatened by a near-peer in the future, the requirement to respond quickly could be lessened. Should this occur, nuclear-armed ICBMs could be eliminated, and the deterrence could be maintained using only a combination of SLBMs and bombers. The result would be significant savings.

Further Reduction in Stockpile Numbers

The downward trend in numbers of weapons in the stockpile will likely continue. Using effects-based analyses, the stockpile will be sized to support the overall capabilities required. While the Moscow Treaty has established targets for 2012, further cuts to the nuclear weapons stockpile may be possible as the elements of the new triad are implemented. These cuts move toward the Defenders' goal but better correlate with the Gamblers' point of view: maintain a sufficient stockpile to meet the US national security requirements.

Assuming a stockpile containing RRW-type weapons and an infrastructure capable of producing replacement parts and/or new weapons, it is logical that the stockpile could be cut below the 2012 target of 1,700–2,200 operationally deployed weapons but remain high enough that rogue states cannot gain superpower status with a few operational warheads. This lower level may be higher than desired by Defenders.

Specific Air Force Actions to Support Recapitalization Decisions

This paper has focused on broad issues associated with maintaining a credible nuclear deterrent. This section provides specific actions the USAF can take to support its task of maintaining the nuclear deterrent.

The Air Force has been a key player in nuclear forces since the Army Air Corps dropped the first nuclear weapon on Hiroshima. However, with the end of the Cold War and later emphasis on recapitalizing conventional forces while enhancing space capabilities, the Air Force paid little attention to nuclear weapons issues. While many challenges associated with the stockpile may be outside the USAF's purview, it is responsible for executing portions of the nuclear mission that require continuing engagement and support. The Air Force needs to advocate for specific requirements and ensure specific capabilities are developed that address identified/expected capability shortfalls. In fact, one of the most important actions it can implement is to reassert the importance of its nuclear mission.

From 1946 to 1992, the United States relied on the Strategic Air Command (SAC) to carry out the air portion of the national nuclear mission. This mission was recognized as extremely important to the nation, and much of the USAF leadership in that period grew up in SAC. This led to a continued emphasis on the importance of the nuclear mission and recognition of the efforts by the USAF community to carry it out.

Since the end of the Cold War created the perception that nuclear deterrence plays a much more limited role in US national security strategy, the Air Force focused on other areas and lost its emphasis on the nuclear mission. This loss of focus has led to the perception that it no longer considers its nuclear mission as important as other missions. The destructive capability of a nuclear weapon alone strongly suggests that this perception must be reversed. The following actions are recommended.

Identify Air Force Requirements for RRWs

Some may assume that decisions on whether the NWC needs to be transformed are outside the purview of the Air Force—that this is a matter for the NNSA and/or the DOE. This is

incorrect. The Nuclear Weapons Council established the RRW JPOG and named the Air Force as co-chair in recognition of its key responsibilities in any RRW decisions. As a result, the Air Force has been an active player in the RRW efforts.

The USAF expends significant resources to successfully carry out its nuclear mission. RRW provides an opportunity to include enhanced safety and security measures within a nuclear package to allow significant changes to how the Air Force is organized, trained, and equipped. Dr. John Harvey, director of Policy and Planning at the NNSA, postulated: "What if I told you that we could achieve absolutely assured nuclear weapons security and use control? Such a nuke could sit out on the front lawn of the Forrestal Building in Washington unguarded. No unauthorized person would be able to gain access to the weapon to employ it, mine its weapons-usable nuclear materials, or gain any classified knowledge about nuclear design from it. In short, stealing one of these nukes would provide a terrorist with absolutely nothing of value."[8] While Dr. Harvey acknowledged that this is simply an idea or concept at this time, the Air Force could significantly reduce security forces if an RRW contained these types of features.

In addition to reduced security forces, improvements in reliability and maintainability could reduce the number of maintainers required (e.g., ease of access to replaceable parts could reduce overall maintenance time and ultimately reduce the number of maintainers) as well as reduce the frequency of maintenance actions (enabled by longer life components). In an era of constrained budgets, the USAF will be required to identify efficiencies in all areas. As a primary "operator" of nuclear weapons, it has a key stake in a recapitalization decision. Most importantly, it must ensure that its capability requirements are included in any replacement warhead design. The USAF should engage in the larger discussion of how these capabilities support its overall mission and ensure understanding of priorities. To gain additional congressional approval and funding for RRWs, it will be important for the Air Force to explain how the RRW program objectives support the military requirements. An example of a lesson learned occurred during congressional hearings on the Robust Nuclear Earth Penetrator (RNEP). As reported in the Congressional Research Service (CRS) report,

the following interchange occurred between Sen. Harry Reed and DOE secretary Spencer Abraham:

> Reed: Is there a specific military requirement for the RNEP today?
>
> Abraham: It was the conclusion of the Nuclear Posture Review that a threat that needed to be addressed in the 21st century in the immediate period ahead of us would be hard, deeply buried targets. A number of approaches to dealing with that were then asked to be researched. This is just one of them. It's a threat that rose to the level of being included in that review.
>
> Reed: There's no doubt about the threat. But it's your opinion that the position of the administration is there is a specific military requirement for the RNEP, not for a device to counter deeply buried targets, but for the RNEP? Is that your position?
>
> Abraham: No. The position of the administration is that we should inquire about or that we should make inquiries and investigate a variety of approaches to dealing with the hard, deeply buried target. Whether or not this approach is feasible is the first question. And the second is whether or not it's preferable to other approaches that would involve conventional weapons. And we have not completed the first phase of that inquiry, let alone the second.[9]

The conclusion reached in the CRS report was that there was no military requirement for the RNEP. In discussions of RRW, it is critical that the military requirements be understood and supported.

Use RRW to Transform Air Force Nuclear Forces/Processes

While the RRW study initially focused on the transformation of the DOE NWC, the Air Force should expand this effort to address its infrastructure. How can the Air Force transform itself with RRWs? What processes can be reduced/eliminated with RRWs? What USAF requirements need to be levied on RRWs to ensure this transformation? In answering these questions, the Air Force must focus on the expected cost savings and ensure procedures are established to realize those expected savings.

Link ICBM Modernization Efforts with RRW

The USAF efforts to modernize its ICBM delivery vehicles must be closely connected to RRW. Efforts have begun to identify alternatives for the Land-based Strategic Deterrence Pro-

gram (Minuteman III replacement). Requirements for ICBMs and the RRW must be linked to ensure synergies are addressed early in the design process. If the Land-based Strategic Deterrence Program requires a capability within RRW, then RRW should include that and vice versa.

Summary

Initially, the feasibility study indicates that the RRW should be used as a catalyst to achieve the NPR vision of a responsive infrastructure. As the nuclear weapons complex is transformed, it may be possible to further reduce the reserve component of the stockpile. Such reduction would complement the Gamblers' goal of having enough warheads to meet the requirements and partially address the Defenders' goal. Another key consideration is the life-cycle cost savings expected from RRW. Gaining/maintaining consensus on the need for RRW will be nearly impossible if the expected life-cycle cost savings do not materialize.

The USAF needs to remain engaged in all recapitalization decisions and ensure that military requirements are addressed. Additionally, it should review the possible advantages a RRW could provide to existing Air Force processes and identify early the key drivers that would result in significant efficiencies in these Air Force procedures.

Notes

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Chapter 5

Conclusion

To be prepared for war is one of the most effective means of preserving peace.

—George Washington

The twenty-first century presents decision makers with a highly volatile security environment. To ensure the freedom and liberties that are hallmarks of this nation, the United States must be prepared to rapidly respond to future threats, including nuclear responses, if required. Defenders view nuclear weapons as a necessary evil for deterrence but do not expect them to ever be used again in war. Aggressors see a much more dangerous world in the future and desire a full toolbox to address several scenarios. Gamblers want to hedge their bets to ensure the United States considers the most pessimistic view of future security environments but recognize that funding limitations will mean that not all tools can be acquired at once. The United States requires a sufficient nuclear deterrent as well as the capability to quickly remanufacture and/or produce a new nuclear weapon to respond to future threats.

Experts are divided on whether the current stockpile can be maintained indefinitely without resuming nuclear testing. However, they tend to agree on the following points:

1. The current nuclear weapons stockpile is safe and reliable today.
2. Aging and changes from LEPs result in changes to previously tested warheads.
3. The United States security environment has significantly changed since the end of the Cold War.

Experts do not agree on the steps the United States should take as a result of these points. The United States is at a decision point—begin the effort to recapitalize the existing stockpile and transform the nuclear weapons infrastructure or continue along the current path, which includes maintaining existing

weapons systems for the next 20 to 30 years. Continuing the status quo requires the United States to accept the risk that the ability to quickly remanufacture and/or produce nuclear weapons may eventually be lost. To mitigate this risk, the transformation of the legacy stockpile must begin soon.

The NPR established a responsive infrastructure as one of the legs of the new triad to address future uncertainties. The NWC that was created to manufacture and maintain warheads has not been sufficiently modernized and is at risk to support refurbishment and correct future problems. The United States cannot afford to lose the ability to design, develop, produce, and maintain nuclear weapons. It cannot afford to gamble on an optimistic view of the future in which the strategic security environment eliminates the need for a nuclear deterrence. In a report on the rationale and requirements for nuclear weapons, the National Institute for Public Policy states,

> As noted, the various recommendations for nuclear disarmament or deep reductions are based on the assumption about the present and future that U.S. nuclear weapons no longer serve a purpose or that a very modest capability is adequate for national security. Yet, any current assumption about the future security environment is highly speculative. It changes constantly, and the post–Cold War period appears to be particularly dynamic. . . . It is not now possible, for example, to anticipate with confidence the requirements for nuclear deterrence over the course of the coming two or three decades. Will challengers be easily deterred by U.S. conventional and/or nuclear threats, or highly motivated and insensitive to cost and risk? Will U.S. conventional and/or nuclear threats be judged credible by foes, and prove effective for deterrence? Or, will challengers judge the credibility of U.S. deterrence policies to be low?[1]

The United States must plan for an uncertain strategic security environment that will continue to require a credible, reliable, and safe nuclear deterrent capability.

The RRW feasibility study shows great promise. Nuclear weapons scientists and engineers are completing the initial designs that, it is hoped, will demonstrate the feasibility of designing, manufacturing, and fielding a replacement warhead that does not require nuclear testing. By following the RRW to conclusion and then producing an RRW, data can be collected on areas within the NWC that need to be transformed. A responsive infrastructure is the cornerstone of the risk-mitigation strategy to address an uncertain future security environment and the risks

associated with maintaining the existing stockpile. One note of caution: the support gained for RRW will not hold if expected life-cycle cost savings do not materialize.

A responsive infrastructure could enable deeper cuts in the existing stockpile. It is expected that a responsive infrastructure limits the number of weapon systems required for the reserve stockpile. The capability to quickly manufacture a weapon to meet a specific, future security capability is another benefit. Nuclear weapons have not been used in war for more than 60 years. It is in the United States' interest to extend this "nonuse" as long as possible.

To gain the support required to recapitalize the nuclear weapons, the Air Force needs to be clear in its requirements for nuclear warheads. Should the question arise on whether there is a military requirement for reliable nuclear warheads with improved safety and security, the answer should be a simple "yes." Without strong, vocal, and sustained military support, efforts to pursue RRW into production will be hindered, and critics may be able to turn off RRW before it really gets started. At the same time, the Air Force can use RRW to identify possible efficiencies in its nuclear operations. Through close coordination, the Air Force can take full advantage of features built into the replacement warheads.

Note

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